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Original Article

Association of sedentary behavior patterns with eating and lifestyle habits among public school teachers

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Word count: 4.194 words.

ABSTRACT

Objectives: To verify the existence, even in predominantly orthostatic work, therefore in light physical activity, of association of sedentary behaviors and its breaks with lifestyle variables (eating habits, physical activity and alcohol consumption) in teachers.

Design: Cross-sectional study. **Participants:** In total, 245 teachers (186 women and 59 men) were randomly selected to participate in the study. **Primary and secondary outcome measure:** Sedentary behavior was evaluated by screen time in different devices on the questionnaires provided by Sedentary Behavior Research Network and Physical Activities was assessed by questionnaire in three different domains (work/occupational, sports/gym, and leisure time) and in total PA. Lifestyle variables and cofounding factors were self-reported. **Results:** Teachers with high sedentary behavior showed lower chances of consuming white meat (OR=0.44[CI=0.24-0.79]) and greater chances of high alcohol consumption (OR=1.96[CI=1.17-3.28]). Teachers with more interruptions in sedentary behavior at work presented greater chances of consuming cereals (OR=2.49[CI=1.05-5.92]) and being moderately (OR=2.60[CI=1.28-5.28]) or sufficiently physically active (OR=2.57[CI=1.14-5.77]). Those with more interruptions in sedentary behavior in leisure time demonstrated higher chances of fruit (OR=2.33[CI=1.28-4.23]) and vegetable consumption (OR=1.91[CI=1.05-3.49]), as well as being physically active (OR=2.34[CI=1.03-5.35]).**Conclusion:** High sedentary behavior was associated with inadequate eating habits. Individuals with greater interruptions in this behavior were more likely to present adequate eating habits and be physically active.

Keywords: Sedentarism; Breaks; Foods; Physical Activity.

ARTICLE SUMMARY

Strengths and limitations of this study

Limitations:

➢ This study has a cross-sectional design that does not allow cause and effect inference.

➢ The use of a questionnaire to assess the level of physical activity and sedentary behavior did not allow a more robust assessment.

Strengths:

➢ We highlight the random sample, as well as the sample size of teachers, and the control of the variables by confounding factors in the analyses between sedentary behavior, physical activity and lifestyle variables.

➢ The evaluation of physical activity addressing different domains in teachers, and considering the different domains of breaks in sedentary behavior.

➢ Teachers work with a non-sedentary physical activity profile, and are categorized as moderately active in their work functions. It has been observed that physically active jobs can be associated with increased sitting time during leisure, however the relationship between occupation type and sedentary behavior outside work needs further research to understand these associations. Thus, one of the novelties of the present study was to contemplate in the same research the relation between sedentary behavior and breaks in sedentary time with lifestyle variables in teachers.

INTRODUCTION

Nowadays, people spend much of their awake time on sedentary activities, resulting in increased sitting time, whether during work, transportation, or leisure (Chastin et al., 2015)[1]. Sedentary behavior is defined as any activity characterized by an energy expenditure equal to or less than 1.5 metabolic equivalents and performed in a seated, reclined, or lying posture (Compernolle et. al, 2016)[2].

Estimates from the World Health Organization (WHO, 2008)[3] highlight that 3.2 million people worldwide die prematurely each year because of a sedentary lifestyle. The adult population spends around one-third to one-half of the day in a seated position, as well as spending prolonged hours of leisure on screen activities such as watching TV, using computers, participating in screen-based recreation, or driving (Nam et al., 2016)[4].

It is considered that sedentary behavior can be evaluated in three ways: 1) checking for specific behaviors, such as television time; 2) quantification of sedentary time in a specific domain (work, leisure, or transportation); 3) total time allocated to all manifestations of sedentary behavior throughout the day (Healy et al., 2011)[5]. A large proportion of daily sedentary behaviors are accumulated in the work scenario; studies have observed that office workers spend at least two-thirds of their working hours seated (Thorp et al., 2012; Ryan et al., 2011)[6-7] and with technological advances, sitting has become the normative stance (Hadgraft et al., 2015)[8]. Changing the profile of people from sedentary to active through small attitude changes, such as interruptions from sedentary behaviors to light activities, whether walking down the corridor to talk to co-workers or extending the distance walking to the restroom, can lead to important health benefits (Owen et al., 2010)[9].

Despite the recurrent concern with work in which individuals remain largely seated, there is doubt as to how sedentary behavior manifests in the life of subjects who

carry out a profession which includes predominantly non-sedentary activities. Teachers represent a considerable professional category in Brazil, with more than 2.6 million teachers in basic and higher education (Vedovato & Monteiro, 2014)[10]. The work of the teacher involves a considerable physical load, since teachers remain in the orthostatic position for 95% of activities performed (Cardoso et al., 2009)[11]. In addition, the outstanding physical effort of teaching activities, coupled with biomechanical factors present in repetitive demand activities and developed in ergonomically inadequate environments, explain the complex nature of the teaching professional's role (Dias et al., 2017)[12]. Teachers work with a non-sedentary physical activity profile (Vaz & Bharathi, 2004)[13], and are categorized as moderately active in their work functions (Farahmand et al., 2000)[14].

It has been observed that physically active jobs can be associated with increased sitting time during leisure, however the relationship between occupation type and sedentary behavior outside work needs further research to understand these associations (Saidj et al., 2015)[15]. Thus, one of the novelties of the present study was to contemplate in the same research the relation between sedentary behavior and breaks in sedentary time with lifestyle variables in teachers.

Therefore, the objective of this study was to verify the association of sedentary behavior and breaks in this behavior with eating habits, physical activity, smoking, and alcohol consumption among teachers of the state school system.

METHODS

This is an observational cross-sectional study and all procedures were performed according to the Ethics and Research Committee of University (process number 72191717.9.0000.5402). All volunteers were duly informed about the procedures and

objectives of the study and those who agreed to participate signed the Informed Consent Term.

Sample Selection and Inclusion Criteria

Presidente Prudente is a Brazilian city located in the west region of Sao Paulo State, with a population of 207,625 inhabitants and a Human Development Index (HDI) of 0.846 (Official website of the municipality of Presidente Prudente, 2017)[16]. According to the City Department of Education, the number of teachers in the city is approximately 650, allocated in 23 schools. All schools were visited and all teachers in each school were invited to participate in the survey, thus encompassing the different regions of the city (north, south, east, west, and central).

The data collection did not interfere in the pedagogical activities of the visited schools, and was performed during the class of collective pedagogical work, at which time all teachers of the institution were present. All teachers were invited to participate at least three times by the coordinator of the school. The coordinator, randomly (lottery), chose the participating teachers. The following inclusion criteria were adopted: i) be effective teachers (statutory) or hired in the state education network, even if as a coordinator or deputy director; ii) be present in the class of collective pedagogical work marked in advance for the accomplishment of the study.

Sample Calculation

The sample calculation considered a prevalence of outcome of 50%, adopted in epidemiological studies (Agranonik & Hirakata, 2011)[17], a population of teachers of the state education system of 650 teachers, a 95% confidence interval, test power of 80%,

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and tolerable error of 5%, which provided a simple random sample of 242 teachers. Even though all 23 schools in the city were invited, only 13 gave permission for the collection of data.

Organization of Data Collection

The application of the questionnaire was carried out in the school environment by previously trained researchers, so that any doubts were promptly resolved. Evaluations of the anthropometric measurements (weight, height, and waist circumference) were performed in rooms provided by the management of the schools participating in the study. In order to avoid possible constraints, male teachers were evaluated by a male researcher and female teachers by a female researcher.

Sedentary Behavior

The subjective model used to measure this variable was based on the questionnaires provided by The Sedentary Behavior Research Network (SBRN, 2016)[18], and the sedentary behaviors evaluated were represented by the number of daily hours in the week teachers spent on each behavior: watching television, using the computer or cell phone/tablet, and time sitting or lying down during awake time, both on the desktop and off. The responses were categorized into: i) less than 1 hour (0 hour computed); ii) more than 1 hour but less than 2 hours (1 hour computed); iii) more than 2 hours but less than 3 hours (2 hours computed); iv) more than 3 hours but less than 4 hours (3 hours computed); v) more than 4 hours but less than 5 hours (4 hours computed); vi) more than 5 hours (5 hours computed). Subjects classified as presenting high sedentary behavior were those who reported the sum of television, cell/tablet, computer, and

sitting time equal to or greater than 8 hours per day, in accordance with the criteria of Van der Ploeg et al. (2012)[19].

Breaks in sedentary behavior at work and in leisure time were assessed through self-report, using the following questions:

- In your work environment, do you usually get up to go to the bathroom, drink water, or perform other activities that require you to stand or walk for at least a short time?

- In your leisure time, do you usually get up to go to the bathroom, drink water, or perform other activities that require you to stand or walk for at least a short time?

The answers to these questions were presented on a Likert scale, with the options: i) never; ii) rarely; iii) sometimes; iv) often; and v) always.

Anthropometry

All participants were assessed barefoot and wearing light clothing. Body mass, height, and waist circumference were evaluated. Body mass was measured using a digital scale (Plenna® brand, Sao Paulo, Brazil) with an accuracy of 0.1 kg. Stature was evaluated by a portable stadiometer (Sanny® brand, American Medical of Brazil, Sao Paulo, Brazil) with a maximum extension of 2.20 meters and precision of 0.1cm.

Eating Habits, Consumption of Alcohol and Tobacco

Eating habits were self-reported regarding the weekly frequency in the number of days of consumption for fruits, vegetables, dairy products, fried foods, sweets, grains, white meat or fish, soft drinks, snacks, and cereals. Participants who reported a weekly frequency of ≥5 times a week were classified as high consumption and those who reported a weekly frequency <5 times a week as low consumption.

The consumption of alcohol and tobacco was self-reported with respect to the number of days in the previous month, in doses and number of cigarettes, respectively. Teachers who reported consuming alcoholic drinks on 1-2 or more days and 1-2 doses per day were considered as presenting high consumption of alcohol and those who reported smoking any cigarettes in the previous 30 days were considered as smokers.

Practice of Physical Activity

The practice of physical activity was evaluated through a questionnaire by Baecke et al. (1982)[20]. This instrument evaluates the habitual practice of physical activities through three different domains (physical activity at work, physical activity in leisure and sports practice, and physical activity outside work), presenting a dimensionless score and the sum of these three scores represents the total physical activity practice. The cutoff point for classifying the individuals was arbitrarily defined by quartiles: "sufficiently active" included those individuals who were in the highest quartile for the Baecke score (4th quartile), "moderately active" those located in intermediate quartiles (3rd and 2nd quartiles), and "insufficiently active" those subjects located in the first quartile.

Socioeconomic Status

The Brazilian Economic Classification Criteria (Instituto Brasileiro de Opinião Pública e Estatística, 2009)[21] was used to assess socioeconomic status. This questionnaire takes into account the degree of education of the household head, the presence and quantity of certain rooms and goods in the home (television, DVD, radio,

bathroom, car, washing machine, freezer), and classifies respondents into classes A1, A2, B1, B2, C1, C2, D, and E.

Statistical analysis

The characterization variables of the sample are expressed as mean and standard deviation. The association of high sedentary behavior and breaks in sedentary time with independent variables (eating habits, smoking, alcohol consumption, and physical activity) were evaluated by the chi-square test. Variables with associations of p≤0.200 were considered in the multiple model, performed by Binary Logistic Regression, in crude analysis and adjusted by sex, age, and socioeconomic condition. Statistical significance was fixed at 5% and the 95% confidence interval was adopted, with analyzes in the software SPSS v.15.0.

Patient and Public Involvement

Patients and or public were not involved in the research.

RESULTS

The sample consisted of 245 individuals (~38% of the teachers), with 186 females (76%), 59 males (24%), and a mean age of 45.20 ±10.42 years. Table 1 presents information regarding sample characterization. Teachers with a longer time in sedentary behavior presented significantly higher fried food consumption (P = 0.007), higher weekly consumption of salty snacks (P = 0.035), and higher alcohol consumption (P = 0.011).

Table 1. Characterization of the sample

Variables	Low SB Mean (SD)	High SB Mean (SD)	P
Age (years)	47.27 (9.93)	43.53 (10.53)	0.006
Weight (kg)	72.09 (15.97)	75.91 (17.41)	0.078
Height (cm)	163.25 (7.95)	165.23 (8.89)	0.070
Fruits (days/week)	4.89 (2.20)	4.36 (2.28)	0.068
Vegetables (days/week)	5.45 (1.87)	5.12 (2.00)	0.192
Dairy Products(days/week)	4.94 (2.37)	4.78 (2.43)	0.610
Fried Foods (days/week)	1.35 (1.22)	1.89 (1.76)	0.007
Sweets (days/week)	2.97 (1.99)	3.28 (2.31)	0.281
Grains (days/week)	5.95 (1.80)	5.85 (1.73)	0.650
Cereals (days/week)	2.44 (2.29)	2.25 (2.11)	0.491
White Meat (days/week)	4.01 (1.99)	3.59 (1.76)	0.085
Soft Drinks (days/week)	1.29 (1.68)	1.42 (1.61)	0.531
Snacks (days/week)	0.36 (0.85)	0.64 (1.15)	0.035
Alcoholic Beverages (doses)	0.96 (1.89)	2.24 (4.73)	0.011
Smoking (cigarettes/day)	2.92 (1.57)	1.43 (0.83)	0.370
Physical Activity (Baecke' score)	7.61 (1.91)	7.68 (1.64)	0.404

SB= Sedentary Behavior; SD= Standard Deviation.

Table 2 presents information regarding high sedentary behavior and variables of eating habits and lifestyle. It was observed that teachers with high sedentary behavior demonstrated a low prevalence of white meat consumption (40.5%) and a high prevalence of alcohol consumption (64.2%), both of which were statistically significant. Marginal associations were observed with low fruit consumption (P = 0.071) and high fried food consumption (P = 0.056).

Table2. Association between high sedentary behavior and independent variables in teachers.

Variables	Total (n=245) n	High Sedentary Behavior (n=135) n(%)	p
Fruits			
Low consumption	108	67 (62.0)	0.071
High consumption	135	67 (49.6)	
Vegetables			
Low consumption	77	44 (57.1)	0.743
High consumption	165	89 (53.9)	
Dairy Products			
Low consumption	93	53 (57.0)	0.790

High consumption	149	81 (54.4)	
Fried Foods			
Low consumption	221	118 (53.4)	0.056
High consumption	19	15 (78.9)	
Sweets			
Low consumption	167	86 (51.5)	0.120
High consumption	76	48 (63.2)	
Grains			
Low consumption	41	24 (58.5)	0.763
High consumption	200	109 (54.5)	
Cereals			
Low consumption	198	113 (57.1)	0.574
High consumption	43	20 (46.5)	
White Meat			
Low consumption	167	102 (61.1)	0.005
High consumption	74	30 (40.5)	
Soft Drinks			
Low consumption	225	125 (55.6)	0.743
High consumption	16	8 (50.0)	
Snacks			
Low consumption	235	130 (55.3)	0.691
High consumption	3	2 (66.7)	
Alcoholic Beverages			
Low consumption	136	65 (47.8)	0.015
High consumption	109	70 (64.2)	
Smoking			
Non-Smoker	229	127 (55.5)	0.841
Smoker	17	9 (52.9)	
Physical Activity			
Insufficiently active	53	25 (47.2)	
Moderately active	128	77 (60.2)	0.661
Sufficiently	65	34 (52.3)	

Table 3 presents information on the magnitude of the associations between sedentary behavior and variables with a value of P≤0.200 in the chi-square analysis. There was no relation between high sedentary behavior and fruit consumption; however, teachers with high sedentary behavior were 3 times more likely to present high fried food consumption in the unadjusted model, while in the adjusted analysis, this relationship became marginal (p = 0.167). In relation to white meat consumption, teachers with high sedentary behavior were 56% less likely to eat white meat and 96% more likely to present high alcohol consumption, this relationship becoming marginal after adjustments.

Table 3. Association between high sedentary behavior and independent variables in teachers.

Variables	Not Adjusted			Adjusted		
	OR	95%CI	p	OR	95%CI	p
Fruits						
Low consumption	1.00	1.00		1.00	1.00	
High consumption	0.60	0.36-1.00	0.051	0.73	0.42-1.26	0.267
Fried Foods						
Low consumption	1.00	1.00		1.00	1.00	
High consumption	3.27	1.05-10.17	0.040	2.30	0.71-7.46	0.167
Sweets						
Low consumption	1.00	1.00		1.00	1.00	
High consumption	1.61	0.92-2.81	0.091	1.50	0.84-2.67	0.168
White Meat						
Low consumption	1.00	1.00		1.00	1.00	
High consumption	0.43	0.24-0.76	0.003	0.44	0.24-0.79	0.006
Alcoholic Beverages						
Low consumption	1.00	1.00		1.00	1.00	
High consumption	1.96	1.17-3.28	0.011	1.66	0.97-2.85	0.065

Adjusted for sex, age, and socioeconomic status. OR=Odds Ratio; 95%CI= 95% Confidence Interval.

Table 4 shows the associations between the breakdown of sedentary behavior at work and variables of eating habits and lifestyle. It should be noted that teachers with the greatest breaks in sedentary behavior at work were 2.5 times more likely to demonstrate high cereal consumption. Teachers with the greatest breaks in sedentary behavior in this domain were also 2.6 times more likely to be moderately physically active and physically active.

Table 4. Association between breaks in sedentary behavior at work and independent variables.

	Not Adjusted			Adjusted		
	OR	95%CI	p	OR	95%CI	p
Fruits						
Low consumption	1.00	1.00		1.00	1.00	
High consumption	1.32	0.76-2.27	0.313	1.62	0.90-2.92	0.108
Vegetables						
Low consumption	1.00	1.00		1.00	1.00	
High consumption	1.34	0.75-2.37	0.315	1.63	0.89-3.01	0.116
Dairy Products						
Low consumption	1.00	1.00		1.00	1.00	
High consumption	1.56	0.90-2.71	0.112	1.93	10.7-3.51	0.029
Fried Foods						
Low consumption	1.00	1.00		1.00	1.00	
High consumption	1.36	0.47-3.92	0.567	0.89	0.29-2.73	0.838
Sweets						
Low consumption	1.00	1.00		1.00	1.00	
High consumption	1.18	0.65-2.14	0.578	1.10	0.60-2.05	0.743
Grains						

Low consumption	1.00	1.00		1.00	1.00	
High consumption	1.85	0.93-3.69	0.078	1.77	0.87-3.58	0.115
Soft Drinks						
Low consumption	1.00	1.00		1.00	1.00	
High consumption	1.04	0.34-3.11	0.941	0.67	0.21-2.19	0.518
Cereals						
Low consumption	1.00	1.00		1.00	1.00	
High consumption	1.94	0.89-4.29	0.099	2.49	1.05-5.92	0.038
White Meat						
Low consumption	1.00	1.00		1.00	1.00	
High consumption	0.68	0.38-1.22	0.203	0.61	0.33-1.13	0.120
Alcoholic Beverages						
Low consumption	1.00	1.00		1.00	1.00	
High consumption	1.12	0.65-1.93	0.674	0.97	0.55-1.72	0.929
Smoking						
Low consumption	1.00	1.00		1.00	1.00	
High consumption	1.15	0.39-3.39	0.796	1.00	0.32-3.08	0.995
Physical Activity						
Insufficiently active	1.00	1.00		1.00	1.00	
Moderately active	2.65	1.35-5.18	0.004	2.60	1.28-5.28	0.008
Active	2.61	1.21-5.63	0.014	2.57	1.14-5.77	0.022

Adjusted for sex, age, and socioeconomic level. OR=Odds Ratio; 95%CI= 95% Confidence Interval.

When considering sedentary behavior in leisure, high breaks in this type of behavior were associated with greater chances of high consumption of fruits and vegetables, in which the teachers with high breaks were two times more likely to consume these foods. Another important indicator is that teachers with high breaks in sedentary leisure behavior were more likely to be physically active (P = 0.043). This information is presented in Table 5.

Table 5. Association between breaks in sedentary behavior at leisure time and independent variables.

	Not Adjusted			Adjusted		
	OR	95%CI	p	OR	95%CI	p
Fruits						
Low consumption	1.00	1.00		1.00	1.00	
High consumption	2.31	1.32-4.05	0.003	2.33	1.28-4.23	0.005
Vegetables						
Low consumption	1.00	1.00		1.00	1.00	
High consumption	1.81	1.02-3.21	0.043	1.91	1.05-3.49	0.035
Dairy Products						
Low consumption	1.00	1.00		1.00	1.00	
High consumption	1.38	0.79-2.41	0.257	1.36	0.76-2.44	0.298
Fried Foods						
Low consumption	1.00	1.00		1.00	1.00	
High consumption	0.92	0.33-2.53	0.876	0.94	0.32-2.73	0.947
Sweets						
Low consumption	1.00	1.00		1.00	1.00	
High consumption	1.18	0.65-2.15	0.581	1.21	0.65-2.24	0.541

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3 **Grains**
4 Low consumption
5 High consumption
6 **Soft Drinks**
7 Low consumption
8 High consumption
9 **Cereals**
10 Low consumption
11 High consumption
12 **White Meat**
13 Low consumption
14 High consumption
15 **Alcoholic Beverages**
16 Low consumption
17 High consumption
18 **Smoking**
19 Low consumption
20 High consumption
21 **Physical Activity**
22 Insufficiently active
23 Moderately active
24 Active
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Grains						
Low consumption	1.00	1.00		1.00	1.00	
High consumption	1.11	0.53-2.29	0.779	1.11	0.53-2.33	0.773
Soft Drinks						
Low consumption	1.00	1.00		1.00	1.00	
High consumption	0.53	0.19-1.49	0.231	0.48	0.16-1.44	0.193
Cereals						
Low consumption	1.00	1.00		1.00	1.00	
High consumption	1.80	0.81-3.98	0.145	2.04	0.87-4.80	0.100
White Meat						
Low consumption	1.00	1.00		1.00	1.00	
High consumption	1.14	0.62-2.08	0.667	1.14	0.61-2.12	0.678
Alcoholic Beverages						
Low consumption	1.00	1.00		1.00	1.00	
High consumption	0.91	0.53-1.59	0.763	0.95	0.53-1.68	0.951
Smoking						
Low consumption	1.00	1.00		1.00	1.00	
High consumption	0.77	0.27-2.17	0.628	0.84	0.30-2.41	0.751
Physical Activity						
Insufficiently active	1.00	1.00		1.00	1.00	
Moderately active	1.68	0.86-3.30	0.129	1.75	0.87-3.55	0.116
Active	2.07	0.94-4.57	0.070	2.34	1.03-5.35	0.043

Adjusted for sex, age, and socioeconomic level. OR=Odds Ratio; 95%CI= 95% Confidence Interval.

DISCUSSION

The present study observed a relationship between high sedentary behavior and unhealthy eating habits, highlighting the lower possibility of consumption of white meat and non-consumption of fruits, besides an increase in the chances of consuming alcoholic beverages in teachers. Regarding breaks in sedentary behavior at work and in leisure time, an association was observed with healthier eating habits and greater chances of being physically active.

The predominance of females in the sample appears to be a trend in the area of basic education. This is a reflection of the introduction, in the second half of the twentieth century, of women into the work environment, especially in the functions of teachers and nurses, considered as care functions and an extension of domestic activities (Cardoso et al., 2009)[11]. It should be added that, according to UNESCO (2004)[22], 81.3% of Brazilian teachers are female.

Spending more time watching television was related to less frequent consumption of fruits and vegetables, and more frequent consumption of sugary drinks and fast food (Compernolle et al., 2016)[2]. Three lifestyle factors are listed as stimulators of spontaneous food intake, namely, watching television, sleep deprivation, and alcohol consumption; emphasizing that alcohol and television increase short-term food intake, increasing the peak of reward and decreasing inhibitory control (Chapman et al., 2012)[23].

Regarding the association of the habit of watching television with worse alimentary consumption, it was observed that individuals who reported this habit presented greater consumption of soft drinks and meats with excess fat, and lower consumption of fruits and vegetables. Television is a distracting activity that causes subjects to ignore sensations such as satiety; thus, greater concentration by the viewer generates a greater propensity for food consumption. Finally, food advertising directs the choices to products of high energy density and low nutritional content (Maia et al., 2016)[24]. In the same sense, a systematic review on the influence of television on food consumption and obesity among adolescents found a significant association between the habit of watching television during meals and the consumption of red meats, fast foods, snacks, and soft drinks, as well as a significant association and inverse relationship between watching TV during meals and consumption of fruits and vegetables (Rossi et al., 2010)[25].

The majority of females in the study sample revealed a possibly common scenario for other studies involving teachers; the presence of double tasks (school and domestic). This factor may be responsible for the decrease in women's health, leading to insufficient time for leisure, rest, and hours of sleep, which would imply high levels of stress, less time to perform physical activities, and a greater probability of alcohol

consumption (Vedovato & Monteiro, 2014)[10]. Therefore, the peculiarities of the teaching career, coupled with the double tasks of women, may suggest reasons for the high consumption of alcoholic beverages, since sedentary behavior is associated with unhealthy eating habits, such as alcohol consumption (Pearson & Biddle, 2011)[26]. The practice of physical activity combined with healthy eating habits could be guiding elements for achieving weight loss, improving physical capacity, and preventing diseases (De Araújo & De Araújo, 2000)[27]. It is known that light intensity physical activity increases the metabolic rate, and the energy cost of such activities throughout the day can contribute significantly to the total daily energy expenditure (Pate, O'Neil & Lobelo, 2008)[28].

In this sense, greater interruptions in sedentary time were associated in a beneficial way with variables of metabolic risk, such as adiposity and triglyceride measurements. Therefore, recommendations to regularly "break" sedentary time, either in the workplace or during television advertising are important (Healy et al., 2008)[29].

We observed that teachers, who, even when engaged in a non-sedentary work activity, promoted greater interruptions in the short time they were sedentary at work or in leisure, demonstrated better eating habits (consumption of cereals, fruits, and vegetables) and better physical activity. In a study with teachers about the practice of physical activity in free time, the hypothesis was raised that the association with the practice of insufficient physical activity in free time may have occurred in the opposite direction, that is, teachers who practice physical activity may present greater physical fitness to withstand physiological workloads, and thus, feel the standing time in the performance of teaching activities less intensely (Dias et al., 2017)[12]. This may be the explanation for our findings, since teachers who are physically active tend to break sedentary behavior more frequently, whether at work or in leisure.

The present study is limited by its cross-sectional design, which prevents the analysis of cause and effect. The self-report assessment of variables is another factor to be considered and may be vulnerable to biases. However, advancements in this study were the assessment in a specific and important professional class who perform light intensity physical activities during almost all their work time, rather than in sedentary behavior, where most studies concentrate their efforts and investigation how sedentary behavior and lifestyle habits are associated. It should also be noted that the data collection was performed in the workplace, not sent electronically. This allows for greater veracity in the collected data, especially in the anthropometric measurements, and not in a self-reported way.

In summary, we observed an association of high sedentary behavior with unhealthy eating habits, such as reduced white meat intake and high consumption of alcoholic beverages. However, a higher frequency of discontinuation of sedentary behavior was associated with healthy eating habits (greater chances of eating cereals, fruits, and vegetables) and better rates of physical activity. Actions to raise awareness about the health of teachers are essential, since knowledge obtained, when not transmitted to the major stakeholders, becomes innocuous and does not produce changes in behavior in society. The main functions of this type of study are to provide indicatives about health profiles and possible linked risk factors. It should be emphasized that the findings of this research can contribute to strategies of health promotion actions for these teaching professionals.

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DECLARATIONS

Ethics approval and consent to participate

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Informed consent was obtained from all individual participants included in this study. The Research Ethics Committee Involving Human Beings of UNESP - São Paulo State University approved this study (Protocol: 72191717.9.0000.5402).

Consent for publication

Not applicable.

Availability of data and materials

All data generated or analyzed during this study are included in this published article [and its supplementary information files].

Competing interests

The authors declare that they have no competing interests.

Funding

Not applicable.

Authors' contributions

We declare that all authors named in this paper: Leandro Dragueta Delfino; William Rodrigues Tebar; Fernanda Caroline Staquecini Gil Tebar; Jefferson Marinho de Souza; Marcelo Romanzini; Rômulo Araújo Fernandes and Diego Giulliano Destro

Christofaro participated in the present study based on the following criteria about authorship recommendations:

- Substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work;

- Drafting the work or revising it critically for important intellectual content;

- Final approval of the version to be published;

- Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Acknowledgements

Not applicable.

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Association of sedentary behavior patterns with dietary and lifestyle habits among public school teachers: a cross-sectional study

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Original Article

Association of sedentary behavior patterns with dietary and lifestyle habits among public school teachers: a cross-sectional study

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Word count: 3967.

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ABSTRACT

Objectives: To analyze the association of sedentary behavior patterns with dietary and lifestyle habits among public school teachers. **Design:** Cross-sectional study. **Participants:** A sample of 245 teachers (186 women and 59 men) with mean age of 45.2 (±10.4) were randomly selected from public schools. **Primary and secondary outcome measure:** Sedentary behavior was assessed by hours spent watching television, computer and cellphone/tablet use, and in sitting position. Sedentary breaks were reported in a Likert scale in domains of work and leisure time. Dietary habits were assessed by weekly consumption of fruits, vegetables, dairy products, fried foods, sweets, grains, cereals, white meat, soft drinks, and snacks. Physical activity, smoking, alcohol consumption, and socioeconomic status were assessed by using questionnaires. **Results:** The prevalence of high sedentary behavior, high sedentary breaks at work and at leisure were 57.9%, 67.7%, and 70.2% in the sample, respectively. No relationship was observed of high sedentary behavior with dietary and lifestyle habits in adjusted analysis. However, high sedentary breaks at work were associated to high consumption of dairy products (OR=1.93[CI=1.07-3.51]) and cereals (OR=2.49[CI=1.05-5.92]), and with being high physically active (OR=2.57[CI=1.14-5.77]). High sedentary breaks at leisure time were associated to high consumption of fruits (OR=2.33[CI=1.28-4.23]) and vegetables (OR=1.91[CI=1.05-3.49]), and with be high physically active (OR=2.34[CI=1.03-5.35]). High sedentary breaks were associated to better dietary habits even among teachers with high sedentary behavior. **Conclusion:** High sedentary breaks were associated with better dietary habits and with high levels of physical activity among public school teachers, even those with high sedentary behavior.

Keywords: Screen time; Sitting; Sedentary breaks; Food consumption; Physical activity.

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ARTICLE SUMMARY

Strengths and limitations of this study

Limitations:

➢ Cross-sectional design does not allow cause and effect inference in the present study.

➢ Subjective assessment of physical activity and sedentary behavior (questionnaire) did not allow a more robust evidence.

Strengths:

➢ A randomly selected sample and analyses controlled by sex, age, and socioeconomic status.

➢ Physical activity and breaks in sedentary behavior were assessed in domains of occupation and leisure time.

➢ The association of sedentary breaks in different domains with dietary habits among teachers has not been previously analyzed in literature.

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INTRODUCTION

Sedentary behavior is defined as the time spent in activities of energy expenditure of ≥1.5 METs in seated, reclined, or lying posture (Compernolle et. al, 2016)[1]. Nowadays, people spend much of their awaked time on this type of activities, resulting in an increased sedentary behavior both at work and leisure time (Chastin et al., 2015)[2].

World Health Organization report highlights that 3.2 million of deaths per year were attributed to sedentary lifestyle (WHO, 2008)[3]. Adult population spends around one-third to one-half of daily time in sedentary behavior, with prolonged hours on screen-devices as watching TV, using computers, participating in screen-based recreation, or driving (Nam et al., 2016)[4].

The amount of time in sedentary behavior has been widely evaluated in three ways: 1) checking for specific behaviors, such as television time; 2) quantification of sedentary time in a specific domain (work, leisure, or transportation); 3) total time allocated to all manifestations of sedentary behavior throughout the day (Healy et al., 2011)[5]. In this sense, a large proportion of daily sedentary behaviors has been accumulated at work environment, once studies observed office workers spend at least two-thirds of their working hours seated (Thorp et al., 2012; Ryan et al., 2011)[6-7]. Besides, due to technological advances, sitting position has become a normative stance (Hadgraft et al., 2015)[8].

Sitting time has been related to unhealthy dietary habits in adults (Compernolle et al., 2016)[1]. Besides that, screen devices have been associated to exposure of food advertisements, which may lead to consumption of products of high energy density and low nutritional content (Maia et al., 2016)[9]. In this sense, the assessment of the relationship between sedentary patterns and dietary habits is important for public health,

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once adults with a healthy dietary pattern showed a more active lifestyle than those with unhealthy dietary patterns (Hsueh et al., 2019)[10], and the association of physical activity and healthy dietary habits contributes to the prevention of diseases (De Araújo & De Araújo, 2000)[11].

However, how life habits of predominantly non-sedentary workers is affected by the levels of sedentary behavior is not consensual in literature, mainly among teachers. In Brazil, there are more than 2.6 million teachers of basic and higher education, which represents a large professional category (Vedovato & Monteiro, 2014)[12]. Besides that, teachers' workload is characterized by a considerable physical requirement, once these professionals remain for 95% of their work activities in orthostatic position (Cardoso et al., 2009)[13]. In addition, teachers perform a high demand of repetitive activities, most of them in ergonomically inadequate environments and in a complex nature of the teaching professional's role (Dias et al., 2017)[14]. Teachers therefore has a non-sedentary physical activity profile (Vaz & Bharathi, 2004)[15], and teachers are categorized as moderately active in their work functions (Farahmand et al., 2000)[16].

Nevertheless, physically active jobs can be associated with increased sitting time during leisure, and the relationship between occupation type and sedentary behavior outside work needs further research (Saidj et al., 2015)[17]. Besides that, frequent breaks in sedentary activities has been considered as an important strategy to mitigate the health impairments of sedentary behavior, once sedentary breaks with light activities (i.e. walking down the corridor to talk to co-workers or extending the distance walking to the restroom), can lead to important health benefits (Owen et al., 2010)[18].

Thus, the present study aimed to analyze in the same research the relation between sedentary behavior and breaks in sedentary time at work and leisure with

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dietary and lifestyle habits in public school teachers, controlled by confounding factors

such as sex, age, and socioeconomic status.

METHODS

An observational study with cross-sectional design was performed according to

the Ethics and Research Committee of University (process number

72191717.9.0000.5402). All participants were duly informed about the objectives and

procedures of the research and those who agreed to participate signed the Informed

Consent Term.

Sample Selection and Inclusion Criteria

Sample was selected in the city of Presidente Prudente, which is located in the

Southern region of Brazil. There are about 207,625 inhabitants in the city of Presidente

Prudente , which has a Human Development Index (HDI) of 0.846 (Brazilian Institute

of Geography and Statistics, 2017)[19]. According to the City Department of Education,

the number of public school teachers in the city is approximately 650, allocated in 23

schools.

Data collection was performed during the period of collective pedagogical work,

at which time all teachers of the institution were present, so that did not interfere in their

pedagogical activities. The teachers were invited to participate for at least three times by

the school manager. To participate of the research, the following inclusion criteria were

adopted: i) be effective teacher (approved in civil service exam) or hired by the state

education network; ii) participate of all procedures (questionnaire, anthropometry) and

sign the Informed Consent Term.

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Sample Calculation

The minimum sample size was calculated for a greater Research Project about Health Behaviors in Teachers, which considered a prevalence of outcome of 50%, adopted in epidemiological studies with unknown prevalence or several outcomes (Agranonik & Hirakata, 2011)[20], a population of 650 public school teachers in the city, a confidence interval of 95%, a test power of 80%, and tolerable error of 5%, which provided a simple random sample of 242 teachers. From all 23 schools in the city invited to participate, only 13 gave permission to collect the data, all the 13 schools were visited, and all the teachers of these schools were invited to participate.

Organization of Data Collection

Data collection was performed between the second semester of 2016 and first semester of 2017. The application of questionnaires was carried in the school environment by previously trained researchers, so that any doubts were promptly resolved. Evaluations of the anthropometric measurements (weight, height, and waist circumference) were performed in a specific room provided by the school manager. In order to avoid possible constraints, male teachers were evaluated by a male researcher and female teachers by a female researcher.

Sedentary Behavior

The assessment of this variable was based on the Sedentary Behavior Questionnaire – SBQ (Rosemberg et al., 2010)[21], through the self-reported hours in a typical weekday and at weekend that teachers spent in television viewing, using the

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computer, using cell phone/tablet, as well as in sitting time in a typical weekday. The responses were categorized into: i) less than 1 hour (0 hour computed); ii) more than 1 hour but less than 2 hours (1 hour computed); iii) more than 2 hours but less than 3 hours (2 hours computed); iv) more than 3 hours but less than 4 hours (3 hours computed); v) more than 4 hours but less than 5 hours (4 hours computed); vi) more than 5 hours (5 hours computed).

It was calculated the mean of hours from a typical weekday and from a weekend day reported for each behavior (television, computer, cellphone/tablet) and the sedentary behavior was calculated by the sum of the mean hours and total daily hours reported in sitting. The sample was classified as "high sedentary behavior" and "low sedentary behavior" according to cutoff point of 8 and more hours (Van der Ploeg et al. 2012)[22].

Breaks in sedentary behavior at work and in leisure time were self-reported according to the following questions:

- In your work environment, how frequent do you get up to go to the bathroom, drink water, or perform other activities that require standing or walking for at least a short time?

- In your leisure time, how frequent do you get up to go to the bathroom, drink water, or perform other activities that require standing or walking for at least a short time?

The answers were presented on a Likert scale: i) never; ii) rarely; iii) sometimes; iv) often; and v) always. The sample was divided into "high sedentary breaks" (often, always) and "low sedentary breaks" (never, rarely, sometimes) for each domain.

Anthropometry

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Measurements of body mass, height, and waist circumference were collected with participants being barefoot and wearing light clothing. Body mass was measured using a digital scale (Plenna® brand, Sao Paulo, Brazil) with an accuracy of 0.1 kg. Stature was evaluated by a portable stadiometer (Sanny® brand, American Medical of Brazil, Sao Paulo, Brazil) with a maximum extension of 2.20 meters and precision of 0.1cm. Waist circumference was collected through the middle point between the last rib and superior border of iliac crest (WHO, 2000)[23] by an inextensible measuring tape with precision in millimeters and extension of 2 meters.

Dietary Habits, Consumption of Alcohol and Smoking

Dietary habits were assessed by a food frequency questionnaire about the weekly frequency (days/week) consumption of fruits, vegetables, dairy products (i.e. milk, yogurt, cheese, creamy cheese), fried foods, sweets, grains (i.e. bean, rice, pea, lentil, chickpea, soy), white meat or fish, soft drinks, snacks, and cereals (i.e. oat, granola, cornflakes). This instrument was based on questionnaire proposed by the Brazilian Surveillance System for Risk and Protective Factors for Chronic Diseases by Telephone Survey (VIGITEL)[24], which assess the frequency of consumption through the number of days per week and defines as regular consumption the frequency of ≥5 days per week for different types of food. In this sense, the food consumption was classified as high consumption (≥5 days/week) and "low consumption" (4 or less days/week).

The consumption of alcohol and smoking was assessed through questions of the Brazilian Center for Information on Psychotropic Drugs (Galduróz et al., 1999)[25]. The alcohol consumption questionnaire was composed by the frequency of alcoholic beverages consumed in the last 30 days and the number of doses per day. Teachers who report alcohol consumption for at least 1-2 days/week and 1-2 doses per day were

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classified as "high alcohol consumption". The smoking habit was assessed by questions about the number of days smoked in the last 30 days, as well as the number of cigarettes per day. Teachers who reported smoking any cigarettes in the previous 30 days were considered as smokers. This type of instrument was previously used in epidemiological study (Conner et al., 2017)[26].

Practice of Physical Activity

The practice of physical activity was evaluated by using Baecke questionnaire (Baecke et al., 1982)[27]. This instrument evaluates the habitual practice of physical activities through three different domains (physical activity at work, physical activity in leisure and sports practice, and physical activity outside work), presenting a dimensionless score which ranges from 1 to 5 points for each domain, providing a total score from 3 to 15 points through the sum the three assessed domains. The cutoff point for classifying the individuals was defined by quartiles: "high active" included those individuals who were in the highest quartile for the Baecke score (4th quartile), "moderately active" those located in intermediate quartiles (3rd and 2nd quartiles), and "less active" those subjects located in the first quartile.

Socioeconomic Status

Brazilian Economic Classification Criteria (Brazilian Institute of Public Opinion and Statistics, 2015)[28] was used to assess the socioeconomic status (SES). This questionnaire takes into account the degree of education, and the presence and quantity of certain rooms and goods in the home (television, DVD, radio, bathroom, car, washing machine, freezer). The instrument classifies the sample by scores into classes

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from the highest to lowest: A1, A2, B1, B2, C1, C2, D, and E. The sample was further classified as high SES (A1, A2), medium SES (B1, B2, C1), and low SES (C2, D, E).

Statistical analysis

Data distribution was assessed by Kolmogorov-Smirnov test and, due to non-normal distribution, the characteristics of sample were expressed as median and interquartile range. The median differences were verified by the Wilcoxon rank test for dependent samples and by U Mann-Whitney test for independent samples. The correlation between breaks in sedentary behavior with sedentary time in different domains was analyzed by Spearman Correlation Coefficient. The association of high sedentary behavior and breaks in sedentary time with independent variables (dietary habits, smoking, alcohol consumption, and physical activity) were evaluated by the chi-square test. Variables with associations of $p \leq 0.200$ were considered in the multiple model, performed by Binary Logistic Regression adjusted by sex, age, and socioeconomic condition. For a clustering analysis of sedentary behavior and breaks, the sample was divided into three groups: high sedentary behavior with low sedentary breaks (group 1), high sedentary behavior with high sedentary breaks (group 2), and low sedentary behavior (group 3). Statistical significance was fixed at 5% and the 95% confidence interval was adopted, with analyzes in the software SPSS v.15.0.

Patient and Public Involvement

Patients and the public were not involved in the design or planning of the study.

RESULTS

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The sample consisted of 245 individuals (~38% of the public school teachers from the city), with 186 females (76%), 59 males (24%), and a mean age of 45.2 (±10.4) years. The prevalence of high SES was 5.7% in the sample, followed by 91.0% of medium SES, and 3.3% of low SES. A prevalence of 57.9% of the sample was classified as high sedentary behavior. Median values of sedentary behavior in a typical weekday and at weekend was the same in the sample (6.0 hours [Interquartile range= 6.0], p-value for Wilcoxon rank's test= 0.360), however higher values of television viewing and lower values of computer use at weekend than weekday were observed (p-value for Wilcoxon rank test= 0.001 for both). Table 1 presents information regarding sample characterization according to low and high sedentary behavior. Teachers with high sedentary behavior presented lower age (p= 0.017) and higher consumption of snacks (p= 0.003) and alcoholic beverages (0.001) than teachers with low sedentary behavior.

Table 1. Characterization of the sample according to sedentary behavior level in public school teachers.

Variable	Low SB Median (IR)	High SB Median (IR)	p-value*
Age (years)	**49.0 (12.0)**	**45.0 (17.0)**	**0.017**
Body mass index (kg/m²)	26.5 (7.4)	27.2 (7.8)	0.445
Waist circumference (centimeters)	85.0 (20.0)	88.0 (21.0)	0.334
Fruits (days/week)	5.0 (4.0)	5.0 (4.0)	0.330
Vegetables (days/week)	6.0 (3.0)	6.0 (4.0)	0.307
Dairy Products(days/week)	7.0 (4.0)	5.0 (5.0)	0.164
Fried Foods (days/week)	1.0 (1.0)	1.0 (1.0)	0.216
Sweets (days/week)	3.0 (4.0)	3.0 (4.0)	0.794
Grains (days/week)	7.0 (1.0)	7.0 (2.0)	0.160
Cereals (days/week)	2.0 (4.0)	2.0 (3.0)	0.500
White Meat (days/week)	4.0 (3.0)	3.0 (3.0)	0.354
Soft Drinks (days/week)	1.0 (2.0)	1.0 (2.0)	0.122
Snacks (days/week)	**0.0 (0.0)**	**0.0 (1.0)**	**0.003**
Alcoholic Beverages (doses/day)	**0.0 (1.0)**	**0.0 (3.0)**	**0.001**
Smoking (cigarettes/day)	0.0 (0.0)	0.0 (0.0)	0.595

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Physical Activity (Baecke' score)	7.3 (2.4)	7.4 (2.2)	0.369
Breaks in SB at Work (frequency)	4.0 (2.0)	4.0 (2.0)	0.741
Breaks in SB at Leisure time (frequency)	4.0 (2.0)	4.0 (1.0)	0.907

SB= Sedentary Behavior; SD= Standard Deviation. *p-value for Mann-Whitney U test.

Table 2 presents relation between prevalence of high sedentary behavior and high consumption of foods and lifestyle habits. It was observed higher prevalence of high sedentary behavior among teachers with high consumption of alcoholic beverages than those with low alcoholic beverages consumption (67.0% vs. 50.0%).

Table2. Relation of high sedentary behavior with dietary and lifestyle habits in public school teachers.

	Total (n=245) n	High Sedentary Behavior (n=142) n(%)	Chi-square value	p-value
Fruit				
Low consumption	108	68 (63.0)	2.278	0.131
High consumption	135	72 (53.3)		
Vegetable				
Low consumption	77	46 (59.7)	0.245	0.621
High consumption	165	93 (56.4)		
Dairy Product				
Low consumption	93	58 (62.4)	1.262	0.261
High consumption	149	82 (55.0)		
Fried Food				
Low consumption	221	124 (56.1)	2.212	0.137
High consumption	19	14 (73.7)		
Sweet				
Low consumption	167	92 (55.1)	1.392	0.238
High consumption	76	48 (63.2)		
Grains				
Low consumption	41	27 (65.9)	1.353	0.245
High consumption	200	112 (56.0)		
Cereal				
Low consumption	198	116 (58.6)	0.795	0.372
High consumption	43	22 (51.2)		
White Meat				
Low consumption	167	101 (60.5)	2.301	0.129
High consumption	74	37 (50.0)		
Soft Drink				
Low consumption	225	130 (57.8)	0.014	0.905

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High consumption	16	9 (56.3)		
Snack				
Low consumption	235	135 (57.4)	0.103	0.748
High consumption	3	2 (66.7)		
Alcoholic Beverage				
Low consumption	136	**68 (50.0)**	**7.135**	**0.008**
High consumption	109	**73 (67.0)**		
Smoking				
Non-Smoker	229	131 (57.2)	0.365	0.546
Smoker	17	11 (64.7)		
Physical Activity				
Less active	53	35 (58.3)		
Moderately active	128	40 (63.5)	1.401	0.496
High active	65	67 (54.5)		

Table 3 presents the magnitude of associations between high sedentary behavior

and variables with a p-value ≤0.200 in chi-square analysis. No significant relationship

was observed after adjustment for confounding factors (sex, age, and socioeconomic

status).

Table 3. Multivariable-adjusted odds ratios and 95% CIs for association between high
sedentary behavior and independent variables in teachers.

	OR	95%CI	p
Fruit			
Low consumption	1.00	Reference	-
High consumption	0.84	0.48; 1.46	0.534
Fried Food			
Low consumption	1.00	Reference	-
High consumption	1.54	0.51; 4.63	0.445
White Meat			
Low consumption	1.00	Reference	-
High consumption	0.67	0.38; 1.20	0.179
Alcoholic Beverage			
Low consumption	1.00	Reference	-
High consumption	1.63	0.95; 2.81	0.076

Adjusted for sex, age, and socioeconomic status. OR=Odds Ratio; 95%CI= 95% Confidence   Interval.

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Table 4 shows the associations of breaks in sedentary behavior at work and at leisure time with dietary and lifestyle habits. High breaks in sedentary behavior were reported by 67.7% of sample in the work domain and 70.2% at leisure time. It was observed that teachers with high breaks in sedentary behavior at work were almost twice as likely to have high consumption of dairy products, 2.5 times more likely to have high consumption of cereals and 2.6 times more likely to be moderately and high active. When considering breaks in sedentary behavior at leisure time, teachers who reported high sedentary breaks were more likely to have high consumption of fruits and vegetables, and more likely to be high actives. The correlation coefficient between breaks at work and breaks at leisure time was 0,408 (p-value for Spearman = 0.001). According to sedentary time, the amount of breaks at work was correlated to computer use (r= 0.126, p=0.049), cell phone/tablet (r=0.171, p=0.007), and sitting time (r= -0.185, p=0.007). No correlation between breaks at home and domains of sedentary behavior was observed in Spearman Correlation Coefficient test.

Table 4. Multivariable-adjusted odds ratios and 95% CIs for association between high breaks in sedentary behavior with dietary and lifestyle habits in public school teachers.

	High Breaks in SB at Work (n=166)			High Breaks in SB at Leisure time (n=172)		
	OR	95%CI	P	OR	95%CI	P
Fruit						
Low consumption	1.00	Reference	-	1.00	Reference	-
High consumption	1.62	0.90-2.92	0.108	**2.33**	**1.28-4.23**	**0.005**
Vegetable						
Low consumption	1.00	Reference	-	1.00	Reference	-
High consumption	1.63	0.89-3.01	0.116	**1.91**	**1.05-3.49**	**0.035**
Dairy Product						
Low consumption	1.00	Reference	-	1.00	Reference	-
High consumption	**1.93**	**1.07-3.51**	**0.029**	1.36	0.76-2.44	0.298
Fried Food						
Low consumption	1.00	Reference	-	1.00	Reference	-
High consumption	0.89	0.29-2.73	0.838	0.94	0.32-2.73	0.947

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Sweet						
Low consumption	1.00	Reference	-	1.00	Reference	-
High consumption	1.10	0.60-2.05	0.743	1.21	0.65-2.24	0.541
Grains						
Low consumption	1.00	Reference	-	1.00	Reference	-
High consumption	1.77	0.87-3.58	0.115	1.11	0.53-2.33	0.773
Soft Drink						
Low consumption	1.00	Reference	-	1.00	Reference	-
High consumption	0.67	0.21-2.19	0.518	0.48	0.16-1.44	0.193
Cereal						
Low consumption	1.00	Reference	-	1.00	Reference	-
High consumption	**2.49**	**1.05-5.92**	**0.038**	2.04	0.87-4.80	0.100
White Meat						
Low consumption	1.00	Reference	-	1.00	Reference	-
High consumption	0.61	0.33-1.13	0.120	1.14	0.61-2.12	0.678
Alcoholic Beverage						
Low consumption	1.00	Reference	-	1.00	Reference	-
High consumption	0.97	0.55-1.72	0.929	0.95	0.53-1.68	0.951
Smoking						
Low consumption	1.00	Reference	-	1.00	Reference	-
High consumption	1.00	0.32-3.08	0.995	0.84	0.30-2.41	0.751
Physical Activity						
Less active	1.00	Reference	-	1.00	Reference	-
Moderately active	**2.60**	**1.28-5.28**	**0.008**	1.75	0.87-3.55	0.116
High Active	**2.57**	**1.14-5.77**	**0.022**	**2.34**	**1.03-5.35**	**0.043**

Adjusted for sex, age, and socioeconomic level. OR=Odds Ratio; 95%CI= 95% Confidence Interval.

Table 5 presents a clustering association analysis of different patterns of sedentary behavior with dietary and lifestyle habits of public-school teachers. Teachers with high sedentary behavior, but with high sedentary breaks at work and leisure (group 2) were 3.38 times more likely to have high consumption of fruits than those teachers with high sedentary behavior and low sedentary breaks (group 1). The odds to have high consumption of fruits was also higher among teachers with low sedentary behavior (group 3) when compared to the first group. Teachers located into group 2 were 3.6 times more likely to have high consumption of dairy products and 2.3 times more likely to be highly active when compared to group 1. These results were observed independently of sex, age, and socioeconomic status.

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Table 5. Multivariable-adjusted odds ratios and 95% CIs for clustering association of different sedentary behavior patterns with independent variables in public school teachers

	Group 1 High SB + Low Breaks (n=65)			Group 2 High SB + High Breaks (n=77)			Group 3 Low SB (n=103)		
	OR	95% CI	p-value	OR	95% CI	p-value	OR	95% CI	p-value
High consumption of Fruit	1.00	Reference	-	**3.38**	**1.61; 7.10**	**0.001**	**2.24**	**1.14; 4.42**	**0.020**
High consumption of Vegetable	1.00	Reference	-	1.90	0.90; 4.01	0.091	1.38	0.69; 2.73	0.362
High consumption of Dairy product	1.00	Reference	-	1.92	0.94; 3.91	0.072	1.64	0.85; 3.19	0.142
High consumption of Fried food	1.00	Reference	-	0.76	0.24; 2.42	0.636	0.59	0.17; 1.42	0.188
High consumption of Sweet	1.00	Reference	-	1.49	0.72; 3.07	0.284	0.99	0.49; 2.01	0.971
High consumption of Grains	1.00	Reference	-	1.48	0.63; 3.50	0.363	2.13	0.93; 4.91	0.076
High consumption of Cereal	1.00	Reference	-	**3.59**	**1.19; 10.86**	**0.024**	2.81	0.97; 8.17	0.057
High consumption of White meat	1.00	Reference	-	0.83	0.39; 1.79	0.635	1.36	0.67; 2.73	0.394
High consumption of Soft drink	1.00	Reference	-	0.37	0.09; 1.59	0.182	0.85	0.25; 2.91	0.791
High consumption of Snack	1.00	Reference	-	0.83	0.05; 14.08	0.899	0.82	0.05; 14.13	0.892
High consumption of Alcohol	1.00	Reference	-	1.09	0.55; 2.16	0.803	0.64	0.33; 1.24	0.186
Be a smoker	1.00	Reference	-	1.06	0.30; 3.73	0.927	0.99	0.28; 3.51	0.987
Be high active*	1.00	Reference	-	**2.34**	**1.05; 5.22**	**0.037**	1.84	0.84; 4.04	0.128

Analysis adjusted by sex, age, and socioeconomic status. High SB= Sedentary behavior of 8 and more hours/day; Low SB= Sedentary behavior below 8 hours/day; Low Breaks= reported to break sedentary behavior never, rarely, or sometimes for both work and leisure time domains; High Breaks= reported to break sedentary behavior often or always for both work and leisure time domains. *4th quartile of Baecke's score. Bold values are statistically significant.

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DISCUSSION

The present study observed a prevalence of 58% of high sedentary behavior in public school teachers. However, teachers with high breaks in sedentary behavior were associated with better dietary habits and physical activity, even among those with high sedentary behavior, independently of sex, age, and socioeconomic status.

The sample of the present study was composed in majority by females (76%), which appears to be a trend in the area of basic education. This could be a reflection of the insertion of women in the work environment, from the second half of the twentieth century, especially in functions of teaching and nursing, considered as care functions and an extension of domestic activities (Cardoso et al., 2009)[13]. It should be highlighted that, according to UNESCO (2004)[29], the prevalence of Brazilian female teachers is 81.3%, being even higher than in this present study.

The majority of females in the study sample revealed a possible common scenario for other studies involving teachers; the presence of double tasks (school and domestic). This factor may be responsible for the decrease in women's health, leading to insufficient time for leisure, rest, and hours of sleep, which would imply high levels of stress, less time to perform physical activities, and a greater probability of alcohol consumption (Vedovato & Monteiro, 2014)[12]. The prevalence of alcohol consumption was high in the sample (44.4%). Therefore, the peculiarities of teaching career, coupled with the double tasks of women, may suggest reasons for the high consumption of alcoholic beverages, being further aggravated by the report of association of sedentary behavior with alcohol consumption and unhealthy dietary pattern in previous study (Pearson & Biddle, 2011)[30]. These findings meet the results of the present study, once teachers with high alcohol consumption showed higher prevalence of high sedentary behavior than teachers with low alcohol consumption (67.0% vs. 50.0%). It was also

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observed that alcohol consumption associated with television viewing time were factors that encourage excessive eating (Chapman et al., 2012)[31], which may impair even more the dietary habits of teachers with high sedentary behavior and high alcohol consumption over time.

In the present study, teachers with high breaks in sedentary behavior at work were more likely to have high consumption of dairy products and cereals, and more likely to be physically actives. Regarding breaks in sedentary behavior at leisure time, teachers who report high breaks in this domain were more likely to have high consumption of fruits and vegetables, and more likely to be physically active. Convergently with healthy eating habits as observed, the frequent sedentary breaks at work and leisure have been associated to lower metabolic risk, in regard adiposity triglyceride levels (Healy et al., 2008)[32]. Another important factor is breaks in sedentary behavior may be performed even by light intensity activities and it is known that light intensity physical activity increases the metabolic rate and the energy cost of daily activities, which can significantly contribute to increase energy expenditure (Pate, O'Neil & Lobelo, 2008)[33]. By this way, teachers with higher physical activity practice, even in light intensity, may present greater physical fitness to withstand physiological workloads than those who were predominantly sedentary, and may perceive the standing time along the teaching activities as less intensely (Dias et al., 2017)[14].

The present study compared the dietary habits according to groups with different sedentary behavior patterns. The high breaks in sedentary behavior contributes to an increase in the chance of high consumption of fruits and cereals even among teachers with high sedentary behavior. A possible hypothesis is that breaks in sedentary time may provide opportunities to have more access to healthy food choices, which are not always available in the sedentary setting, whether at work or at leisure. Another

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hypothesis is the fragmentation of sedentary behavior may mitigate the influence of sedentary behavior on unhealthy dietary habits.

High breaks in sedentary behavior was also associated to higher chance of be high active among teachers with high sedentary behavior, which was not observed in teachers with low sedentary behavior. This observation reinforces the concept that sedentary behavior and sufficient levels of physical activity were not an inverse of each other (Van der Ploeg & Hillsdon, 2017)[34]. Besides that, breaks in sedentary behavior may lead to better healthy habits as healthy foods consumption and physical activity engaging even among those with high sedentary behavior.

The present study is limited by its cross-sectional design, which prevents the analysis of cause and effect. The self-report assessment of variables is another factor to be considered and may be vulnerable to biases. Sitting time was assessed in overall and its measurement in different domains will provide major inferences. Besides , due to the present study assess only teachers, the inference about lifestyle behaviors of other workers is another important limitation, which does not allow to compare different groups of workers in regard the same variables and consequently to extrapolate the findings to other populations. Another important limitation was the lack of assessment about how many servings per day was consumed for each food, being assessed only the frequency in days per week. Otherwise, advancements in this study were the assessment of the different sedentary patterns in a specific and important category of workers, who perform light intensity physical activities during almost all their work time, where most studies concentrate their efforts and investigation how sedentary behavior and lifestyle habits are associated. It should also be noted that data collection was performed face-to-face survey and anthropometry was objectively measured in the workplace, which allows higher veracity of information.

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In conclusion, this study observed no independent association of sedentary behavior with dietary habits and lifestyle factors among teachers, however, high breaks in sedentary behavior was associated with healthier dietary habits (i.e. high consumption of fruits, vegetables, dairy products, and cereals) and with high levels of physical activity. These positive results were observed even among teachers with high levels of sedentary behavior, when compared to those with high sedentary behavior and low breaks in sedentary behavior. Further investigation are needed to extrapolate these results to other types of workers and to analyze these associations over the time. However, evidence-based information about teachers is helpful to lead positive behavioral health changes of this large sample of workers, as well as to all the people who are dependent on their professional acting.

DECLARATIONS

Ethics approval and consent to participate

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Informed consent was obtained from all individual participants included in this study. The Research Ethics Committee Involving Human Beings of UNESP - São Paulo State University approved this study (Protocol: 72191717.9.0000.5402).

Patient Consent for publication

Not applicable.

Availability of data and materials

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Data of survey are not publicly available aiming to preserve anonymity of information from participants.

Competing interests

The authors declare that they have no competing interests.

Funding

Authors' contributions

We declare that all authors named in this paper: Leandro Dragueta Delfino; William Rodrigues Tebar; Fernanda Caroline Staquecini Gil Tebar; Jefferson Marinho de Souza; Marcelo Romanzini; Rômulo Araújo Fernandes and Diego Giulliano Destro Christofaro participated in the present study based on the following criteria about authorship recommendations:

- Substantial contributions to the conception or design of the work (LDD, WRT, DGDC, MR, RAF);

- Data collection (LDD, JMS, FCSGT, WRT)

- Data analysis and/or interpretation of data for the work (LDD, WRT, DGDC)

- Drafting the work or revising it critically for important intellectual content (LDD, WRT, DGDC, MR, RAF);

- Final approval of the version to be published (all the authors);

- Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved (all the authors).

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Acknowledgements

The authors would like to thank the Education Department of Presidente Prudente for the authorization to conduce the research procedures in the schools, the Managers of the schools which allowed that teachers were evaluated, and for the teachers who agreed to participated in the research.

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STROBE Statement—Checklist of items that should be included in reports of *cross-sectional studies*

	Item No	Recommendation	Page
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	2
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4,5
Objectives	3	State specific objectives, including any prespecified hypotheses	5,6
Methods			
Study design	4	Present key elements of study design early in the paper	6
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	7
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	6
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	7-10
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	7-11
Bias	9	Describe any efforts to address potential sources of bias	11
Study size	10	Explain how the study size was arrived at	7
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	11
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	11
		(*b*) Describe any methods used to examine subgroups and interactions	11
		(*c*) Explain how missing data were addressed	Not applicable
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	11
		(*e*) Describe any sensitivity analyses	Not applicable
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	12
		(b) Give reasons for non-participation at each stage	Not applicable
		(c) Consider use of a flow diagram	Not applicable
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential	12

		confounders		
		(b) Indicate number of participants with missing data for each variable of interest		
Outcome data	15*	Report numbers of outcome events or summary measures		12
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included		12-18
		(*b*) Report category boundaries when continuous variables were categorized		-
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period		-
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses		Not applicable
Discussion				
Key results	18	Summarise key results with reference to study objectives		19
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias		21
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence		22
Generalisability	21	Discuss the generalisability (external validity) of the study results		22
Other information				
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based		23

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.